UNITED
NATIONS

E

Economic and Social Council

Distr.
GENERAL

E/C.7/1993/9
1 March 1993

ORIGINAL: ENGLISH

COMMITTEE ON NATURAL RESOURCES
First session
29 March-8 April 1993
Item 10 of the provisional agenda*

FLOW OF FINANCIAL RESOURCES AND TRANSFER OF TECHNOLOGY TO DEVELOP THE MINERAL RESOURCES OF DEVELOPING COUNTRIES

Ways and means of facilitating the flow of financial resources and transfer of technology to develop the mineral resources of developing countries

Report of the Secretary-General

SUMMARY

The mining sector in developing countries has historically been supported by multilateral, bilateral and private aid programmes and by foreign private investment commensurate with perception of country risk, competing project(s) economics, level of geological potential, information and development, and comfort with the long-term operating horizon.

Recently, an increasing number of developing countries have begun major restructuring programmes in the mineral sector and related areas in an effort to attract and facilitate the flow of private foreign capital. In varying degrees, mining legislation/regulation is in the process of being revised, the exploration and mine-permitting process is being streamlined and tax structuring and profit repatriation terms are being made more favourable. Efforts have also been made to undertake or upgrade geological surveys, make the existing geological data more accessible and train national staff in all skills required in mineral-resources development. Multilateral institutions have expanded programmes to facilitate the flow of financial resources from the private sector by offering extended non-commercial risk insurance coverage, investment-banking services, financing and guarantees, and foreign investment advisory services. Bilateral programmes have also been effective

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in providing direct project funding, technical assistance and technology transfer.

Ways and means to further enhance the flow of financial resources and transfer of technology, as well as a description of programmes already in place and the recommendations of two related United Nations seminars, are provided in the present report. As funding through multilateral and bilateral agencies becomes increasingly restricted, it is expected that programmes that strengthen the flow of funds through private investment will be supported in a mutually beneficial manner.

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INTRODUCTION

1. This report has been prepared in response to Economic and Social Council resolution 1991/87. In recent years, a growing number of developing countries have initiated free market reform programmes in an effort to attract foreign investment and technology and revive economies stalled by decades of protectionist policies and excessive State intervention. In many countries, the revitalization and development of a significant minerals industry is seen as a way of contributing to the growth of the economic base by generating remunerative employment, income for the Government, much-needed foreign exchange; and spin-off benefits for the workforce and professionals from training in the techniques of exploration, mining, marketing and other related disciplines. In addition, increased revenues from the mining sector will assist social development programmes in public health, education and infrastructure.

2. Private, multilateral and bilateral aid programmes have played and will continue to play an important role in developing countries' progression towards economic independence. Foreign direct investments will also contribute significantly to economic independence as countries reposition themselves and become attractive places for foreign companies to invest. With this investment will come increasing access to state-of-the-art technology, training, enhanced management techniques and rehabilitation of outdated technology and infrastructure.

I. RECENT TRENDS IN PRICES, SUPPLY AND DEMAND OF METALS AND MINERALS

3. During the first half of the 1980s, as a result of the relatively slow growth of output in the industrial countries and high energy prices, metal prices steadily declined. As a result, the large stock overhang in the market exerted downward pressure on prices. This led in turn to substantial contractions in mining operations, with subsequent reductions in production capacity.

4. By 1987, stocks for virtually all metals had reached record lows and this set the stage for a sharp recovery in prices over the next two years. Large price increases were also associated with the sharp acceleration in the growth of industrial production in the major industrial countries. Industrial production grew at an annual rate of 1 per cent in 1986, 3 per cent in 1987 and 6 per cent in 1988. 1/ Responding to the rise in metals prices in 1988, some previously closed facilities were reactivated, existing capacity was substantially expanded and new smelting and refining plants were built.

5. The first quarter of 1989, however, marked the end of the boom in prices. The slow-down in world economic growth in 1989 and 1990, combined with increased metals production, led to price declines for a number of metals from 1988 levels and the mining industry continues to be caught in a prolonged cyclical downturn, with base metals particularly hard hit. In addition to the effects of the slow-down in the world economy, the increased export volumes from countries in Eastern Europe and the Commonwealth of Independent States

have exacerbated the oversupply in base metals. The volume of these shipments has increased the inventories of such metals as aluminium and nickel to record levels in the industrialized countries, with consequent downward pressure on prices.

6. On the other hand, there have been reasonably high levels of activity in the mineral industry in Canada, the United States of America and the larger mineral-producing countries of Latin America, although inflation and international debt problems continue to affect the expansion of mineral-resource development activities in Latin America. For the first time in many years, a major new world-class mine development has been inaugurated in Chile, with the start-up of the Escondida copper mine. In the Asia and Pacific region, the outlook of the mineral industry has improved, with increasing levels of activity in Australia and mineral development activities in a diverse range of countries or areas, such as Papua New Guinea, New Caledonia and Mongolia.

7. Moreover, in a number of developing countries, the consumption of metals and minerals has been increasing significantly. The newly industrialized countries of South-East Asia have attained considerable growth rates and have become substantial consumers of metals. China has been a substantial importer of aluminium, copper (concentrated and refined) and zinc during the past decade. In South America, Brazil, Chile and Peru have increased their metal consumption. 2/

8. Nevertheless, barring any major unforeseen developments, prices of virtually all metals and minerals are expected to fall substantially in the early 1990s as a consequence of the slow-down in the rate of growth of most industrialized countries and the coming on stream of a number of new large-scale projects. Moreover, the share of the developing countries in export receipts from major metals has been declining significantly and is expected to continue to do so. The decline in the metal-prices index in the early part of the 1990s will largely be the result of expected softening in the price of nickel, copper, lead, zinc and tin.

II. WAYS AND MEANS TO FACILITATE THE FLOWS OF FINANCIAL RESOURCES

9. An increasing number of developing countries have begun major restructuring programmes in the mineral sector and related areas in an effort to attract and facilitate the flow of private foreign capital. In varying degrees, mining legislation is in the process of being revised, the process of obtaining permits is being streamlined and tax structures and profit repatriation terms are being made more favourable. Efforts have also been made to undertake or upgrade geological surveys and to make the existing geological data more accessible. New funding mechanisms and in some cases the renewed application of already existing strategies are being introduced and are being structured to encourage major long-term investment.

10. The aim of this section of the report is to introduce and reinforce various ways and means of facilitating the flow of financial resources to the mineral sectors of developing countries. The emphasis is on methods of

attracting private foreign investment rather than aid sponsored by Governments or intergovernmental organizations. A greater influx of foreign private investment will enhance technology transfer and may lead to increases in bilateral aid. Because of the changing environmental legislation and government practices in many countries, particularly in parts of North America, many mining companies feel compelled to look for exploration and mining opportunities in other countries, where a shorter lead-time to actual mine start-up is anticipated.

A. Conditions of geology and mineral exploration

11. In making exploration investment decisions, different companies use a variety of decision-making criteria, which are not limited to geology but include political, marketing, regulatory, fiscal, monetary, environmental, administrative, operational and profit criteria. Therefore, in order to enhance the flow of private investment for mineral exploration in developing countries a multitude of issues must be addressed.

12. According to the results of a global survey published by the Economic and Social Commission for Asia and the Pacific (ESCAP), 3/ in which information from 39 exploration/mining companies headquartered in Africa, Asia, Australia, North America and Western Europe was gathered, the following geological criteria were listed as being important to very important in considering exploration investment: general mineral abundance, geological potential for target minerals, availability of geoscientific information and ability to apply geological assessment techniques. The survey suggested the following practical approaches to facilitating ready access to geological data in order to encourage and assist exploration programmes.

1. Geology

13. It was suggested that public access to existing geological data be increased by:

(a) Collecting existing data in one central location, under one agency. This might involve setting up a geological survey or department of mines in certain countries;

(b) Cataloguing data to current industry standards;

(c) Having reports and records available in common languages, including English. Existing reports/records were often only available in the language of the recipient country and/or language of the donor country (if prepared under a bilateral or multilateral aid agency);

(d) Allowing open access to geological information currently or formerly held by State monopolies;

(e) Making the database user-friendly.

14. Government-sponsored geological programmes, it was suggested, should be focused in such a way as to maximize results per dollar expended and improve geological information. This could be achieved by:

(a) Concentrating on airborne geophysics programmes and air-photo coverage;

(b) Updating existing surveys and focusing on good target areas using modern exploration techniques and deposit models, that is, disseminated deposits amenable to heap leach and solvent extraction.

15. In order to better assist external teams, it was suggested that geological and communication skills of resident geological survey teams be upgraded by:

(a) Having them continue to work closely with geological survey teams from other countries;

(b) Encouraging technology exchange programmes and industry/government exchange programmes;

(c) Having various geological survey teams host regional conferences.

16. It was suggested that, in countries with good geological potential, a local State geological body should be developed, if none existed.

2. Mineral exploration

17. In terms of encouraging foreign financial flows for mineral exploration, political, regulatory, investment, fiscal, environmental and monetary issues had emerged as key issues in the survey and concern had also been expressed over the bidding process for concessions in certain countries. Developing countries therefore needed to consider:

(a) Developing and maintaining clearly defined mineral development and fiscal policies with respect to exploration and development, clarifying positions on foreign ownership content, mandatory majority participation by Government and/or nationals, environment-related obligations, management control, tax structures, import/export policies, foreign-exchange regulations and repatriation of profits;

(b) Developing a clearly defined mining code;

(c) Ensuring consistency between fiscal or tax laws and mining laws. In some countries, for instance, although mining laws had been reformed and covered such areas as depreciation and depletion, such changes were not yet recognized by the fiscal or tax authorities, causing difficulties for foreign companies operating in those countries;

(d) Streamlining the process for obtaining the necessary exploration permits and guaranteeing ensuing right to mine;

(e) Developing specific guidelines to regulate the bidding for and subsequent award of concessions in accordance with international standards of ethics and protocol. Rigorous confidentiality agreements should be in place, as well as a streamlined process to ensure legal title and security of tenure (see discussion in sect. II B below).

B. Conditions of mineral rights

18. Two key components stand out with respect to mineral rights:

(a) Mining legislation: this must be clear and concise and spell out the basic legal framework within which exploration and mining can take place. Stability of exploration and mining terms is crucial;

(b) Title and security of tenure: companies active in mining and exploration must be ensured of legal title and security of tenure to mining concessions/properties. This requires good local mineral-resource lawyers, an established mineral-titles system, the support of an organized government infrastructure and a minimum of discretionary practices.

C. Development of country image for mineral-resource development

19. Few industries have more reason to be concerned about country risk than mining. Mining investments by definition are capital-intensive, long-term, immobile exposures to variable tax, regulatory and business operating conditions. The capital invested in developing a mine may exceed US$ 100 million, in some cases more than US$ 500 million. Few projects in the manufacturing and service sectors involve equivalent capitalization. Mining has longer time horizons than other industries, since the time required from the beginning of construction until payback is often five years or more. This does not include the possible three to five or more years of exploration, drilling and assaying prior to commissioning a full feasibility study. Moreover, mining companies do not invest merely to achieve payback but also to realize a return on investment through profitable operations over the life of a mine. Unlike industrial concerns in other sectors, mines cannot relocate if conditions in a country deteriorate. Mines are held captive by the location of the resource and are subject to the prevailing conditions in the country of operation.

20. Mining sensitivity to country risk derives from the experience of the past 30 years. Most negative experiences with country risk have occurred in developing countries, as a result of expropriation, blockage to financial transfers or interruption of operations by war or insurrection. Expropriation with inadequate compensation ranks high in industry consciousness of past adverse treatment. Between 1960 and 1976 a significant number of mines were expropriated around the world.

21. Many of those expropriated mines are now being privatized, as Governments in Latin America, Africa and Eastern Europe implement a new policy of competing for foreign mining companies to develop their mineral resources and to own and

operate their mines. This new openness of many countries to foreign investment in mining presents great opportunities but also significant risk. Developing countries will therefore have to determine the best methods to mitigate the following perceived country risks: expropriation, restrictions on capital repatriation and dividend remittances, interruptions from war or insurrection, taxation changes, regulatory changes, corruption, social violence, inadequate local management and prevalence of infectious diseases. Paragraphs 22 to 28 below list a number of strategies available for mitigating the impact or reducing the probability of various country-risk factors and thereby enhancing country image.

Political risk insurance

22. In many cases, political risk insurance is available from a number of institutions to cover high-profile risks such as expropriation, blockage of the transfer of funds and war and insurrection. Primary sources are the Multilateral Investment Guarantee Agency (MIGA) and national agency insurers such as Export Development Corporation (EDC) of Canada and the United States Overseas Private Investment Corporation (OPIC). However, the amount of insurance available to any one project from these agencies may be limited and able to cover only a portion of a mine's capital exposure. For very high-risk countries insurance may not be available at all. Should this type of insurance not be available for specific country projects, further avenues should be explored.

Reducing the risk of blockage to financial transfers

23. World Bank involvement in project financing, particularly participation by the International Finance Corporation (IFC) in syndicated loans for a mining investment, may help to reduce the risk of blockage to financial transfers.

Bilateral investment protection treaties

24. A bilateral investment protection treaty may be negotiable or may already exist between the investing company's home country and the host country of the investment. Canada has signed such treaties with Argentina, Uruguay, the former Czechoslovakia, Hungary, Poland and the former Soviet Union, and is negotiating a treaty with the Russian Federation. Under a treaty, adverse treatment of an investment may trigger country-to-country discussions and the company may have recourse to binding international arbitration. Investment protection treaties do not diminish the potential impact on a mine of specified country-risk factors but they do help reduce the probability of occurrence. To the extent that a host country values its relationship with the investment company's home country, the host country can be expected to think twice before taking actions in contravention of the treaty.

Mine development agreements

25. A mine development agreement contracted between the investing company and the host country Government is intended to help reduce exposure to risk factors. A number of provisions are common in such contracts: the rate of taxation for the project may be guaranteed for a specified period; the free repatriation of capital and remittance of interest and dividends may be

guaranteed, principally by provision for an offshore account for hard-currency transactions; the freedom of the mine to market its products globally may be guaranteed; and various operational conditions of the mine may be specified.

Equity participation by host Government

26. Equity participation in a mine by the host country Government or host country companies may in certain cases be useful in providing some security against adverse treatment by Government. The argument is that a Government will be less inclined to depress the profitability of a mine if doing so will adversely affect its own financial interest or that of nationals who have invested in the mine. An opposite argument, of course, can be made. Government equity participation provides a window to mine financing, which may assist the Government in devising strategies to extract more revenue. Obviously mining companies will be unhappy if equity participation by Governments leads to managerial interference by Governments. The advisability of equity participation by a host country Government or company in a mining project depends ultimately on country-specific conditions. In other words, one cannot generalize about this being a good idea.

Additional profits tax

27. An additional profits tax (APT) may in some cases be helpful in assuring taxation stability over time. If a project becomes highly profitable, APT automatically adjusts the Government's share upwards, thereby reducing pressure on a Government to extract greater revenue through tax increases or partial expropriation. Investing companies are understandably unenthusiastic about APT, but most are ultimately willing to live with it provided it is not unreasonably onerous. It should be noted that APT may encourage counter-productive management, as companies are likely to operate in ways which will minimize the likelihood of APT being triggered.

Other

28. In soliciting foreign investment, developing countries will need to meet with key foreign government, industry and financing institutions to communicate recent reforms of and changes to mining, investment and fiscal regimes. The following programmes should be considered:

(a) Country-specific information packages and presentations should be developed, covering geological information, mining laws and regulations, current operations, potential prospects, privatization opportunities, physical infrastructure, financial and economic data and country policies;

(b) Key political figures with relevant expertise should be part of a government negotiating team, similar to industry-analyst seminars now conducted by various mining houses in the developed countries;

(c) Integrated information centres, "one-stop shops", should be set up to provide interested companies with detailed geological, mining, tax, economic and financial data;

(d) Country delegations should consider sponsoring and/or attending special seminars aimed at informing possible foreign investors of emerging opportunities. A number of countries have held such seminars in recent times, either on their own or in cooperation with bilateral and multilateral institutions.

D. Equity funding

29. Developing country companies are able to source equity funding from direct private placements, joint venturing and listings of stock on exchanges and subsequent equity offerings. Most projects require a minimum level of equity in order to qualify for debt financing.

Developing country exchanges

30. Sri Lanka, India, Thailand, Malaysia, Singapore, Brazil, the Philippines, the Republic of Korea, Indonesia, Mexico, Turkey, Ghana and China, among other developing countries, have stock exchanges. Generally there is an ownership restriction on the amount of stock which can be held by foreigners.

31. Fundamental to the volume of trading in a stock and hence to its value is the secondary market coverage. Unless a stock is well supported by a good international underwriting firm and its analysts, full value will be difficult to realize and access to private institutional investors limited. As a means of encouraging wider distribution of mineral-resource stock, companies in developing countries might consider the following strategies:

(a) Inter-listing on a major resource board such as the Vancouver Stock Exchange. This would provide immediate access to an effective international trading and settlement capability through which North American and European investors could participate; it would give extensive international exposure, enhance a company's profile internationally and extend the trading hours for these issues. Obviously certain criteria would need to be discussed in order to ensure the successful placing of inter-listed issues;

(b) In conjunction with a global brokerage firm, consideration should be given to developing an equity derivative product around emerging mineral growth stocks.

E. Project finance sources

32. Companies are having to look at a variety of innovative means to finance projects in developing countries. Conventional debt finance through schedule A banks is not always available, due to political country-risk factors and the reserve requirements placed on companies by their own government agencies. Therefore, multilateral lending institutions have been actively involved in structuring and placing loans for certain projects and for providing the necessary guarantees. In addition, there are some interesting forms of project finance emerging, based on the careful structuring and packaging of lending in order to minimize risk. In addition to political risk factors, environmental liability risk is emerging as a key concern to lending institutions.

33. Apart from equity, possible forms of project finance include commodity loans, equipment leases, trade finance, long-term sales contracts and debt finance backed by commodity and currency hedging and option programmes. Niche lenders are likely sources of funding, as well as the major metal-trading houses which require long-term sources of feed for smelters. In order to facilitate the flow of project finance to the developing countries the following might be considered:

(a) Commodity loans: in certain countries, approvals for commodity loans and the required risk management programmes are difficult to achieve. Increasingly, commodity lending and risk management programmes are becoming part of project finance structures;

(b) Equipment loans: large manufacturers of heavy equipment are offering equipment leases as part of an overall finance package. Repatriation of funds and the ability to hold funds in offshore accounts is important in facilitating this form of finance;

(c) Long-term sales contracts: as a means of securing a source of feed for smelters, certain Japanese and other metal-trading companies are prepared to provide either equity or debt finance to projects in developing countries. The consortium led by a Japanese company in the Escondida Project in Chile is an example of such a form of finance. To facilitate this form of finance, Governments must be prepared to allow free export of concentrate to the investing company's facility offshore. Mandatory quotas to local smelters would make this type of facility less feasible;

(d) Guarantees: institutions offering project financing have to be comfortable with their guarantees. To facilitate this process, in addition to the normal charges over assets, completion guarantees, parent-company guarantees and so on, certain high-risk countries might consider designating a neutral zone over which a multilateral agency would have control. Title to commodities delivered to this area would then be out of the control of the country and pass to the funding institution.

F. Structure and implementation

34. To facilitate the flow of funds earmarked for the mineral-resource sector in developing countries, finance packages are being devised to minimize the exposure of any one company and lending source. Combinations can now include: equity from more than one source, including the IFC; debt by way of equipment lease, commodity funding; and combined debt/equity packages through long-term sales contracts, whereby funds to the project are secured against long-term flow of product. This type of funding is typically provided by the Japanese trading houses which represent smelters or by other major trading groups representing smelters/refiners or end-users. Actual proportions of debt and equity are balanced against projected cash flows and project owners' contribution and perceived creditworthiness. Risk management programmes to minimize fluctuation in metal prices, currency and interest rate exposure are commonplace and are designed to meet specific project cash flow criteria, as are specific completion test guarantees and insurance requirements. Draw-down of funding is scheduled against specific project time-line criteria.

G. Identification, minimization and assignment of risk

35. Experienced international mining firms and lending institutions apply rigorous programmes for identifying, assessing and minimizing risk. Risk may be placed in three broad categories: technical, commercial and financial, and political. Paragraphs 36 to 40 below define the risk area, highlight the principal sources of risk and indicate the appropriate risk management techniques which could apply.

1. Technical risk

36. Technical risk can be managed by setting up and following specified project evaluation procedures, adhering to best-practice technical standards throughout and performing rigorous testing and analysis through the feasibility study process. This can be achieved by sharing expertise through joint venturing with competent exploration and mining companies; establishing training programmes locally and abroad; hiring top consulting firms experienced in mineral exploration and development; and exchanging information through technical conferences and associations. Key risk areas include:

(a) Reserve estimation;

(b) Site evaluation/geotechnical studies;

(c) Mine design and planning;

(d) Ore treatment and recovery (metallurgy);

(e) Location and services;

(f) Environmental concerns and permitting;

(g) Availability of labour and services (management and general);

(h) Legal environment, including land title, tenure, ownership, joint venture or other agreements;

(i) Calculations of costs, including capital, operating and infrastructure;

(j) Overall project economics, including sensitivity studies;

(k) Permitting process;

(l) Marketing.

37. Lending institutions protect project lending risk in this area by structuring agreements so that certain completion test requirements are met. With respect to environmental risk, this area has become increasingly important to developing countries, banks and other lending groups and mining companies. Approximately one year ago, an international industry group was set up by about 20 of the key international mining firms to address the issue. Membership

includes key Canadian, Australian, Mexican, Chilean and European firms, such as INCO, ASARCO, Noranda, Cominco, BHP, RTZ and Placer Dome. The group, the International Council of Metals and the Environment (ICME), is headquartered in Ottawa and met recently in London to further develop its agenda and scope of operations. The group sees itself as a resource base for government and multilateral institutions on issues related to developing and coordinating world wide environmental standards for the mineral-resource industry.

38. On the subject of the legal environment, efforts are now under way in many developing countries to revise mining legislation and streamline the permitting process. This effort is being recognized by the international mining community and supported through an increased investment response, most noticeably in Chile and Mexico. It is strongly recommended that this process continue as a major incentive towards investment.

2. Commercial and financial risk

39. Risk management techniques are available for many of the components of commercial risk. However, modifications to enhance coverage could be achieved and are addressed below. Key commercial risks include:

(a) Excess volatility in metal prices, interest rates, foreign exchange rates and equity markets;

(b) Non-performance on sales and marketing contracts due to technical or other reasons;

(c) Business-related causes of non-payment, such as insolvency, default, repudiation of goods by buyer and contract termination;

(d) Prompt and efficient transfer of funds;

(e) Inability to secure financing.

Commodity, interest rate and foreign exchange volatility

40. Hedging, option and derivative products exist in the international financial markets to limit exposure to market price movements and are generally required as a provision to debt financing to ensure that coverage ratios are met. Financial lending institutions prefer access to the metal and/or currency offshore in order to feel comfortable structuring such an instrument. Access can come in the form of guarantees by liquid offshore company affiliates or the maintenance of direct accounts offshore. Inter-agency guarantees can also be helpful.

Non-performance on sales and marketing contracts

41. Longer-term contractual sales and marketing arrangements are generally preferred to facilitate new project financing. Non-performance, whether deliberate or categorized as force majeure under standard marketing contracts, does occur. Producers can limit risk by having contracts with more than one buyer or by stipulating that material may be shipped to alternate works/buyers

as a result of force majeure provisions. Some refining companies have operations in a number of countries, and producers often specify that material can be shipped to various locations in the event of problems, which facilitates and expedites payment.

Business-related causes of non-payment

42. Insurance is available for foreign investors through national agency insurers to cover various non-payment exposures. However, certain developing countries are considered by these insurers to be off cover either permanently or from time to time. Consideration needs to be given to developing an insurance network to cover certain of these risks for countries where mineral-resource development is a high priority.

Transfer of funds

43. In certain cases, either the financial system in a developing country is not sufficiently developed to expedite funds or funds are deliberately held up due to documentation irregularities. This results in negative investment responses by outside companies and lenders. While national agency insurers can and do cover certain exposures as indicated above, programmes are now being introduced in Canada to train staff in export expediting. It is recommended that similar training programmes be set up for key country staff to assist in the development of best practices for bank authorization procedures, documentation, international letter of credit procedures etc. Introduction of international bank clearing mechanisms might also be useful.

3. Political risk

44. Political risk is a critical consideration of many investors and lending institutions and covers such non-commercial areas as difficulty in repatriation of funds due to currency and foreign-exchange policy changes, war, revolution or insurrection; expropriation; tax and regulatory changes; corruption; and social violence. Specific ways and means to address these issues have been covered in paragraphs 22-28 above. Lending by international banks will generally be withheld if adequate coverage cannot be obtained from MIGA, bilateral or private agency insurers.

H. Sources of finance

45. There are a number of multilateral, bilateral and private programmes currently in place to assist developing nations in the financing of their mineral-resources development. These include the multilateral development banks, also known as international financial institutions; the United Nations Development Programme (UNDP) and its affiliates; the Arab development funds and investment banks; the Commonwealth secretariat; the European Community (EC); and direct bilateral aid programmes. Non-governmental organizations and corporations are also direct sources of finance.

Multilateral development banks

46. There are six established multilateral development banks: the World Bank, the Inter-American Development Bank, the Asian Development Bank, the Caribbean Development Bank, the African Development Bank (AfDB) and the European Bank for Reconstruction and Development.

Other multilateral financing sources

47. In addition to the six established multilateral banks which provide funding and technical assistance to the mineral sector, there are two major development groups which make contributions, including grant financing: the United Nations system (UNDP, the United Nations Revolving Fund for Natural Resources Exploration (UNRFNRE) etc.) and Arab development funds and investment banks.

Other significant organizations

48. In addition to the large multilateral financial institutions, other large organizations form part of the economic development network. Through a variety of programmes and organizations, they actively provide support for the development of the mineral sector. The Commonwealth secretariat and the European Community form part of this group.

Corporate investment

49. Though not classified as aid, major funding and development expertise comes from international mining sector companies and affiliates. This source of funding and expertise will continue to expand as the investment climate in developing countries is enhanced by changes of political structure, major revisions to mining laws and improved access to geological and exploration data. Small, intermediate and large international mining and processing firms are actively involved world wide in the development of the mineral sector. They are joined by technical service firms, parts and equipment suppliers, trading companies and financial institutions in the development of exploration properties to full-fledged mining and processing operations.

III. EXISTING PROGRAMMES TO SUPPORT THE EFFORTS OF DEVELOPING COUNTRIES IN SECURING INVESTMENTS REQUIRED FOR DEVELOPMENT OF MINERAL RESOURCES

50. As discussed in paragraphs 45-49 above, financial aid and technical assistance programmes are currently available through the large multilateral development banks, the United Nations agencies and regional institutions, bilateral government programmes, non-governmental organizations and country associations. Mineral-resource financing through corporate investment by private and publicly held companies will again become an important factor as developing countries reorient their focus to market-based economies.

51. An overview of the major government-related organizations offering financial and technical assistance aid to developing countries was presented in the preceding section. The present section outlines, in anecdotal style,

practical applications of the various programmes offered by these institutions to support the efforts of developing countries in securing the investments (financial and non-financial) required for the development of their mineral-resources. The programmes are presented according to function in an effort to show the depth and breadth of the programmes.

A. Information services

52. In recent years, a growing number of Governments in Africa, Asia and Latin America have begun reopening their doors to foreign investors. In order to attract foreign investment, major changes to mining codes and tax regimes were required, as well as access to detailed reviews of mineral-resources and other geological data. In order to accomplish this a widespread information services network was also necessary. A number of services have been set up to provide these countries with the necessary support.

Foreign Investment Advisory Service

53. MIGA, jointly with IFC, operates the Foreign Investment Advisory Service (FIAS), which advises Governments on the laws, policies, regulations and procedures necessary to create an adequate investment climate to increase inflows of foreign direct investment. As part of this programme, MIGA also sponsors investment promotion conferences.

United Nations system

54. The United Nations system has been involved in providing information support services to developing country mineral-resource sectors. It also advises Governments on the laws, policies, regulations etc., necessary to create a favourable investment climate for the mineral-resource sector. For example, the Department of Economic and Social Development (incorporating the former Department of Technical Cooperation for Development), in collaboration with the Philippine Department of the Environment and Natural Resources, recently prepared a 200-page prospectus which included information on the country's geology and mineralization, mines, mining law, regulations, policies governing mineral exploration and production. A similar document, entitled "Tanzania - opportunities for mineral-resource development", was prepared for the Government of the United Republic of Tanzania in 1991. In addition, as a follow-up to the Philippines prospectus, three information seminars were scheduled in February and March of 1992 to cover topics ranging from geology and current mining activities to the legal framework within which mineral exploration is conducted. 4/

55. The Department of Economic and Social Development has also been very involved in the drafting of new mining codes aimed at attracting foreign investment. Programmes have recently been undertaken in several West African countries, with emphasis on the least developed and land-locked countries of the region, where new mining codes are being drafted aimed at attracting small to medium investments and to promote artisanal mining, and in Ethiopia, where a recent new mining legislation study was undertaken.

56. In Malaysia, after a three-year study by the Primary Industry Ministry, with assistance from UNDP, a new mineral development policy has been formulated, with Government approval still pending. Under the new policy, miners will be assured of security of tenure, enjoy lower royalty payments and be entitled to improved tax incentives. Foreign mining investors will be allowed to raise their ownership in Malaysian ventures from the current 30 per cent to 100 per cent. The policy also proposes income tax allowances on exploration expenditure and the abolition or reduction of import duties on mining equipment. Similar new mining codes have been adopted in Mexico and Peru.

Trade Development Programme - United States of America

57. The United States State Department, through its Trade Development Programme, is also actively involved in promoting foreign investment in developing countries. It recently completed publication of a joint United States Geological Survey and Servicio Geológico de Bolivia open-file report (91.0286), entitled "Mineral deposits and occurrences of the Bolivian altiplano and Cordillera Occidental, a database of all mineral occurrences in the provinces of La Paz, Oruro and Potosí".

B. Mineral exploration and development programmes

58. It is evident that developing nations are moving towards the encouragement of foreign investments as a means of developing their mineral sectors. Many of the programmes discussed focus on the identification of possible investment opportunities and the subsequent work undertaken to further enhance the resource. These mineral exploration and development programmes are currently being funded through a variety of multilateral and bilateral programmes, as well as directly by international mining groups. A cross-section of programmes is highlighted in paragraphs 59-80 below.

Multilateral programmes

59. The United Nations system has been providing assistance in mineral-resource development programmes in the developing countries of Africa; Latin America and the Caribbean; and Asia and the Pacific. The programmes are being executed, mainly with UNDP funding, by the Department of Economic and Social Development, the regional commissions, the specialized agencies and to a lesser extent UNRFNRE. A few illustrative examples of such activities are described below in paragraphs 60-67.

60. In Latin America, Department of Economic and Social Development programmes have been well utilized, with projects in a growing number of countries, including Guatemala, Honduras, Bolivia and Ecuador. The projects have ranged from conducting assessments of mineral-resources to detailed sampling programmes and further delineation of reserves.

61. The situation in Ecuador is worth noting. In August 1991, Armenonie del Ecuador SA, an Ecuadorean registered mining company with foreign capital, together with a Canadian company and a Japanese company (Armeno Resources Inc. and Nissho Iwai Corp., 50 per cent each) began a joint venture to bring the San

Bartolomé polymetallic mine into production. This is the first underground mining operation in the country in the last 15 years and the first UNRFNRE project in the world from its preliminary exploration programme that has become a productive mine.

62. Since August 1987, UNDP and the Department of Economic and Social Development have provided considerable assistance to Bolivia. A tremendous amount of field-work has been carried out by consultants, the United Nations and Geobol geologists on prospective investment opportunities. The programme has included an assessment of non-metallic resources in Bolivia, an assessment of the alluvial gold potential in Bolivia, detailed sampling of the oxidized zone on Cerro Rico de Potosí and studies on porphyry systems and disseminated gold in sedimentary rocks. Under the assistance programmes, a drilling programme was started in 1991 on the auriferous moraines near Lake Suches (230 km north-west of La Paz).

63. The Department of Economic and Social Development is carrying out assistance programmes in Africa and the Far East. In Sri Lanka, UNRFNRE has offered funding to the Government of Sri Lanka for prospecting for such heavy minerals as ilmenite, rutile, monazite and zircon. The exploration programme will cover the south-western coastal areas in Beruwala and Devinuwara.

64. In Africa, the Department of Economic and Social Development recently financed resource definition work to determine the size of reserves and the characteristics of graphite at the Ancuabe deposit in the northern part of Mozambique - one of several deposits identified as a result of the Hunting aerial survey.

65. In Gabon, favourable results have been obtained by a survey, done in collaboration with the Department of Economic and Social Development, of the potential of the Kolissen gold area about 50 km east of Lamberéné and of the Ndjolé alluvial gold district. The survey has also revealed anomalous gold and base metal values around Nkan, some 50 km north of Ndjolé and 150 km east of Libreville.

66. The United Republic of Tanzania, a country with a rich and diversified mineral potential, is actively cooperating with the United Nations to promote mineral investment. In addition, detailed exploration work is being carried out with United Nations assistance.

67. In Mali, the Syama deposit in the southern Bogoé region was discovered during a gold prospecting project financed by UNDP. In Chad, a mineral inventory and cartography on a semi-detailed scale are under way with the help of UNDP.

Other multilateral programmes

68. In Ethiopia, the Government received assistance from the African Development Fund to carry out further exploration work which could guarantee the expansion of the Lega Dembi mine. The African Development Bank is also involved in funding the final feasibility study for the Matongo igneous phosphate project in Burundi. In Burundi, the European Development Fund is involved in providing funds for a portion of the second phase of the core

drilling programme of the Masaka gold deposit located in the north-east of the country. In Uganda, the International Development Agency has extended credit to the Government of Uganda to conduct a feasibility study on tin and wolfram in order to guide investments in these minerals.

Bilateral aid programmes

69. In addition to funding multilateral programmes, many developed countries carry out direct aid programmes with developing country Governments. These programmes, depending on what is required, may be channelled directly through the central Government agency, or through various separate agencies, such as technical and economic agencies or export development agencies. Bilateral programmes may take any of the several forms outlined in paragraphs 70-73 below.

70. Project aid assistance may be focused on specific projects involving engineering services, technical assistance and training and equipment supply for the construction of an integral capital facility. Project equipment and services are largely provided by donor country firms, which are chosen through a competitive process.

71. Programme aid and lines of credit assistance can be less focused, covering programme aid and lines of credit. Programme aid provides the Government of a recipient country with commodities which support a number of projects of a developmental nature. A general line of credit enables recipient countries to purchase equipment and services from donor country suppliers. Financial institutions of selected developing countries may also be recipients of loans for on-lending to development finance companies. These funds are passed on to private sector borrowers, usually for medium-scale investment projects, on commercial terms.

72. Sector-specific programmes provide equipment and services in areas of donor country expertise for the development of a specific sector identified by the recipient country as a priority.

73. In support of the programmes outlined above, donor countries also finance feasibility studies and detailed engineering and design work for projects of high developmental value. Paragraphs 74-80 below contain examples of bilateral programmes under way, which are included to illustrate the range of assistance available.

74. Canada tends to channel its bilateral aid through the Canadian International Development Agency (CIDA). It sponsors direct project aid programmes and through its Industrial Cooperation Programme will consider funding specific technical and feasibility study programmes. CIDA recently provided funding for the completion of a feasibility study for a potential gold mine in Costa Rica.

75. France is actively involved in exploration activities through its government arm, the Bureau de Recherches Geologiques et Minières (BRGM). In many instances, BRGM acts in a manner similar to a private foreign investor, providing funding and expertise in exchange for an equity position in a project. On other occasions it acts in a bilateral aid capacity. BRGM is

active in Africa and increasingly so in Latin America. Recent activities include a geological survey for gold in the Busia subdistrict of Uganda, the results of which have been submitted to the Government. The survey discovered new gold deposits at Bukade and confirmed other deposits at Osofiri, Makera, and Kitojja Budde. In addition, BRGM recently evaluated a rutile deposit in the Akonolinga area of Cameroon. The evaluation was done as a joint venture between the Government of Cameroon and BRGM. A geological survey has also recently been concluded in Haiti.

76. Germany has been actively involved in providing funding for bilateral technical assistance programmes for the mineral sector. It has recently funded mineral survey and exploration programmes. For example, it was involved in a joint German-Tanzanian gold exploration programme over the Siga and Mbale Hills and in a gold exploration project in the north-west of Burundi. The aid project is being undertaken by Bundesanstalt für Geowissenschaften und Rohstoffe, the German Federal Geoscience Institute.

77. Japan has a number of funding agencies directly involved in bilateral programmes including the Japanese International Development Agency (JIDA), the Overseas Economic Cooperation Fund (OECF), the Japanese International Cooperation Agency (JICA) and the Metal Mining Agency of Japan (MMAJ). MMAJ is extremely active in providing technical assistance in developing countries. It also gathers data on mineral resources for mining investment projects and studies. For example, in 1990 the Governments of Fiji and Japan entered into a three-year programme of mineral exploration activity covering Viti Levu Island in Fiji. The gold-oriented project was fully funded by the Government of Japan via its agent MMAJ. In the first year of the programme, regional mapping and sampling were conducted to identify areas with mineralization potential for further detailed studies. During 1991, detailed mapping and soil geochemical sampling was conducted over most of the Island. The work culminated in the drilling of two diamond drill holes, total depth 602 m. 5/

78. According to recent reports, MMAJ will soon start a three-year exploration study with its counterpart in the Government of Mongolia. Work will be focused on a polymetallic vein deposit in north-east Mongolia, near the Chinese-Russian border. In Pakistan, the Geological Survey of Pakistan (GSP) has established a modern, well-equipped geoscience laboratory in Islamabad under technical assistance from the Government of Japan through JICA, which provided a grant of ¥1,433 million. 6/ The Geological Survey of Japan supervised the installation of the equipment and is training GSP staff. A similar laboratory has also been established in Panama. Japan has also been involved in geological mapping programmes in the Dominican Republic through JICA and in Honduras through JIDA. Through OECF, it has offered assistance to Sri Lanka to import quarrying, earth-moving, excavating and other mining equipment.

79. Sweden: it has been involved in a number of countries on a bilateral and multilateral basis through the Swedish Commission for Technical and Economic Cooperation (BITS), the Swedish Agency for Research Cooperation with Developing Countries (SAREC) and the Swedish Geological Survey (SGAB). SGAB is currently considering funding the development of a mines department in Nicaragua, since no such body currently exists. Sweden has also been involved in geological mapping programmes through BITS.

80. In the United States of America the United States Geological Survey (USGS) has recently been involved in producing and updating geological and mineral-resource maps. In addition, USGS has been involved in providing and funding a research facility. The United States also provides a full range of export and related financing services through the Overseas Private Investment Agency (OPIC).

C. Project and general finance programmes

81. Project and general finance programmes for the development and expansion of mining projects in developing countries are offered by the large multilateral banks (IFC/World Bank being the most prominent); the Commonwealth Development Corporation (CDC); country-specific institutions such as OPIC in the United States, the German Finance Company for Investment in Developing Countries (DEG) and the Fukuda Fund, set up by the Government of Japan to invest in Association of South-East Asian Nations (ASEAN) countries; and small regional institutions with funds provided through multilateral and bilateral programmes. Where private investment is involved, it is important to secure export risk management and financing services, including commercial and non-commercial risk insurance. Commercial and non-commercial risk insurance is available from national agency insurers and from private insurance agencies. Export financing, including credits to foreign customers, purchase of customer promissory notes, arrangement of credit lines for developing country buyers and direct loans, can be made available through the national agency insurers. A comprehensive package of non-commercial risk insurance is offered through MIGA. Examples of recent financing are contained in paragraphs 82-88 below.

82. Namibia: the Geneva-based Société Internationalé Financière pour les Investissements et le Développement en Afrique (SIFIDA) has approved a US$ 1.1 million loan facility for the development of lead-zinc and associated operations run by South Africa's AFMIN holdings in central Namibia. The loan is the first SIFIDA commitment to Namibia and will be used for a US$ 1.5 million expansion and diversification programme at the mining operation of an AFMIN subsidiary, near Swakopmund. 7/

83. Ghana: a US$ 140 million syndicated loan, led by IFC which is providing US$ 40 million of the total, will help finance the expansion programme of the Ashanti gold mine. The expansion includes the construction of a new sulphide ore treatment plant, which will use a new bio-oxidation treatment process. The loan, which is one of the largest made by IFC in Africa, has been syndicated with a group of nine international banks. 8/

84. Sierra Leone: IFC has signed an agreement to provide a US$ 15 million loan to Sierra Rutile Ltd., marking the resumption of international lending for projects in Sierra Leone. Sierra Rutile is rehabilitating its plant and infrastructure and developing new deposits for a total estimated cost of US$ 48 million. Funds will be provided by OPIC, CDC, and DEG. 9/

85. Tunisia: IFC recently announced that it will help finance the development of the Bougrine lead-zinc mine in Tunisia. IFC will provide financing in the form of a US$ 14 million loan and an equity investment of US$ 2.1 million. Deutsche Investitions und Entwicklungsgesellschaft of Germany will provide a

loan of US$ 11.3 million. Total project capital cost is estimated at US$ 50 million. 10/

86. Mauritania: a feasibility study was completed in May 1990 for the development of higher grade iron ore deposits at M'Houdat, about 60 km north-east of Zouérate. Under an agreement ratified in April 1991, the Société Nationale Industriale et Minière, is to receive US$ 60 million from the African Development Bank, plus a loan of 60 million European currency units (ECUs) from the European Investment Bank and FF 300 million from Caisse Centrale Pour Coopération Economique. 11/

87. Peru: by the end of 1991, a US$ 20 million emergency credit line, approved by the Andean Finance Corporation, was channelled to the mining sector through the private banking system. Peru is currently in the process of privatizing certain mining assets as a means of restructuring and modernizing its State-owned industry. 12/

88. Guinea: during 1991, the go-ahead was given for a two-year investment programme to modernize the alumina refinery at Friguia and to upgrade the rail link between Friguia and the port of Conakry. Assistance of US$ 19 million is to be provided by the European Investment Bank under the Fourth Lomé Convention. 13/

D. Technical assistance and training programmes

89. Technical assistance and training programmes are fundamental to the sustained development of a country's mineral resources. As discussed above, multilateral and bilateral programmes, as well as private programmes, all provide assistance in this area. Industry groups and associations also play an integral role and will be discussed in the following section. Examples of current programmes are contained in paragraphs 92 and 93 below.

90. UNDP, through the Department of Economic and Social Development and the regional commissions, is an active supporter of training programmes related to the development of the mineral sector. For example, a four-year project of US$ 2.6 million for training in specialized mineral exploration techniques has been approved for Ethiopia. In August 1991, UNDP granted aid of US$ 3.6 million to the Department of Mines in Chad for reinforcement of its technical capabilities. In Sri Lanka, assistance was sought by mine owners and traders for processing graphite, mica and silica. This was provided through the United Nations Industrial Development Organization (UNIDO).

91. RTZ, a major international mining house headquartered in London, has sponsored a technical management in mining training programme since 1982 in collaboration with the Government of Zimbabwe and London University. The Technical Management Training Trust is focused on providing technical management training to African nationals. The training, which takes place in Europe, lasts 20 months and culminates with work experience in various African mine settings. After nine years of operation, 43 Africans have participated in the programme, with the majority now holding senior positions in the region's mining sector. The programme, which was originally focused on Zimbabwe is to

be expanded to include nearby countries. However, RTZ will no longer be sponsoring the programme.

E. Networking: industry groups and associations

92. To facilitate international and interdisciplinary cooperation, a number of industry groups and associations, specific to the mineral sector have been set up over the years. Many are sponsored through international bodies, such as the United Nations and the Commonwealth secretariat, while others have been organized within a specific sector of the industry and are funded by corporate contributions.

IV. TRANSFER OF TECHNOLOGY TO DEVELOPING COUNTRIES

A. Transfer of technology through foreign direct investment

93. Probably the most significant action taken by developing countries towards encouraging technology transfer has been that of encouraging and supporting foreign private investment in mining. While there are a number of multilateral and bilateral programmes available to facilitate the development of the mineral sector in developing countries and hence also facilitate technology transfer, the mechanisms, level of funding and guarantees are inadequate to support the massive restructuring and modernization required and the new mine potential in these countries. Lack of infrastructure and a skilled workforce are also problematic.

94. A more rapid flow of funding and expertise is required to expedite the transfer of technology to upgrade existing operations, develop new opportunities and in certain countries, such as the Lao People's Democratic Republic, to found a complete new industry. This is likely to come largely from the private sector. Recent changes in mining and tax regimes, active privatization programmes, and successful streamlining of Government processes have also sent a powerful message to companies actively searching world wide to replace and/or expand reserves. With an injection of capital will come access to additional expertise and increasing transfer of technology, both hard technology, such as mining and processing, and soft technology, such as marketing and hedging. However, the process is still in the initial stages and shareholders and financial institutions will require that their companies proceed with caution. This implies that companies will carefully weigh the risks prior to proceeding, particularly in countries perceived as more difficult or politically unstable and will look to such approaches as joint ventures and syndicated projects to minimize exposure. It is likely that this approach, combined with multilateral funding, will result in a more balanced globalization of the mineral sector than would direct takeover by multinational firms.

1. Mining and recovery techniques

95. Technology transfer is taking place as a result of current direct foreign investment, informal and formal exchange of information through technical seminars and upgrading by State owned enterprises such as Codelco in Chile and Vale do Rio Doce in Brazil, as political will and funds are available. Two key examples, in the copper and gold industry sectors, are the emergence of gold heap leach technology and copper solvent extraction-electrowinning (SX-EW) technology. These two industry-changing techniques were developed by mining companies re-examining all possible ways to remain competitive in response to severe cost price pressures in the early 1980s. The result is that deposits previously considered uneconomic or unsuitable for conventional mining and milling techniques have become economic producers. In addition, low-grade oxide deposits are now major exploration targets, which has refocused exploration activity, particularly in developing countries, where there has been little exploration of this nature.

SX-EW

96. SX-EW is a proven method of extracting high-grade copper cathode from low-grade copper oxide ore. The process utilizes a combination of conventional heap leach technology, electrolysis and chemical reagents and bypasses the smelting process. As a result, SX-EW costs are typically below US$ 0.50/lb of copper produced, composed to conventional sulphide milling and flotation costs of between US$ 0.65 and US$ 1.00/lb. SX-EW produces a high-quality cathode product which can be shipped directly to end-users, rather than producing a concentrate which requires smelting and refining. The rapid progress in heap leaching, solvent extraction and electrowinning technology has changed the economies of certain copper resources not previously considered viable. According to a study by Commodities Research Unit Ltd., it is expected that well over 40 per cent of production from new capacity will come in the form of low-cost, electrowon copper. Mining companies are increasingly turning to developing countries for these low cost ore bodies in an effort to replace higher-cost reserves elsewhere. Deposits in Chile and Mexico are particularly amenable to this type of process.

Gold heap leach technology

97. Gold heap leach technology advanced rapidly in the 1980s, transforming low-grade oxide resources (predominantly in the United States) into low-cost mines. This technology is well known by major producers and will dominate development of large low-grade deposits world wide as companies look to replace reserves.

Smelter process technology

98. Another area of significant technological change has been in the smelter/refinery process area as companies have been pushed to improve recovery, reduce costs and meet increasingly stringent environmental emission guidelines. Major changes have taken place at a number of custom smelters. In addition, new custom smelters are required to meet anticipated demands and will probably be built by companies with vested interests in the end product. This

foreign investment by existing companies will bring with it state-of-the-art process technology.

99. Mining seminars as a forum for focusing on this changing technology in the copper industry are now commonplace. For example, the Copper 1991-Cobre 1991 seminar, held in Ottawa, was devoted to copper extraction technology. It was a follow-up to the successful Copper 87 Conference held in Chile, which focused on the changes that had taken place in the industry, including greater use of oxygen, growth of SX-EW production, plant modernization and expansion, improved sulphur capture and plant environment, development of improved control systems and increased recoveries. An excellent example of technology transfer discussed at the conference was the planned adoption of the Codelco smelting technique to modernize the Zambia Consolidated Copper Mines Nkana smelter in Zambia. It is planned to use Codelco pyrometallurgical techniques both for oxygen and fuel oil.

2. Finance and marketing

100. As global financial systems become less stable and perceived political risk factors remain high in many developing countries, financing and finance structures are becoming more complex and of necessity involve more participants. More sophisticated financial skills to incorporate risk management techniques are being developed within multinational mining firms, lending institutions, Governments and State-owned mineral-resource companies. Faced with a need to compete for a limited amount of funds, innovative arrangements are being structured. Developing country Governments are actively seeking extensive information on these new arrangements in order to deal successfully with multinational institutions, scheduled lenders and companies wishing to structure deals.

101. It is important to note that a number of financial institutions and companies are willing to train, internally, staff from government- and State-run companies, as the perceived risk of doing business is reduced by all players having a sound knowledge of fundamentals. This is particularly true on the marketing and hedging side of the business. This attitude has come a long way from that which prevailed in the late 1970s and early 1980s, when ignorance was valued as a means of extracting greater profit. Simply put, ignorance is now seen as too high a risk factor in structuring and maintaining solid financial structures.

3. Management

102. Management expertise is a valued commodity in a world which has changed significantly since the early 1980s, all the more so since the major restructuring of the global financial and social system in the mid-to-late 1980s. The skills needed now have moved from a specific set of functional skills to a wider range of technical, financial and leadership skills.

103. Major multinational as well as junior firms are recognizing the need both to train managers globally across a range of skills and to train local managers, in order to have operations that function appropriately in a highly

cost-conscious, competitive environment. More effort is going into developing local management in addition to an international team of managers because companies realize that sustainable growth depends on a local infrastructure playing an important role in the internationalization of their operations.

104. This is a positive step for developing countries. These programmes are also being enhanced by the many technical exchange, university exchange and assistance programmes offered by multilateral, bilateral and non-governmental organizations. Management development should be enhanced by the introduction of privatization and joint ventures as expertise flows through the new partnerships.

B. Feasibility of establishing geological information systems in developing countries

105. Geoscience information is essential to Governments for the development of sound public policies on the management of mineral, energy and water resources; the management of risk due to natural hazards (earthquakes, floods, volcanic eruptions, etc.); and the protection of the environment and human health. Geoscience information is also required as an instrument of government policy. Among other things, the information is made available by Governments to specific audiences, such as the mineral exploration industry or particular government departments, in order to stimulate national development of natural resources, to reduce the risk due to natural hazards or to promote environmentally sound economic development. This information is of universal application because it forms an integral part of the information framework within which any Government must govern and any nation must function. National geological survey departments are the providers of this information.

106. Government policies can only be developed and implemented if geoscience information is easily available in a form suitable for the users of the information. Nations endowed with rich mineral resources and a government policy to develop these resources in an environmentally responsible manner, if they wish to attract direct foreign investment in the minerals sector, must develop modern geological information services. Without this capability, they will not be in a competitive position over the next decade, relative to other nations that offer information services based on geoscience information databases. As exploration activities in the private sector become dominantly computer-based it will be increasingly more difficult for exploration staff to work effectively with paper-based information.

1. Organizational context

107. A geoscience information project should be implemented in response to a clearly defined goal. This goal should also be within the mandate of the organization that will host the information system. The mandate of a geological survey is founded on government policy and ideally looks outward from the organization. Its purpose is to focus on objectives such as (1) improving the economic vitality of the country by attracting investment; and (2) providing information to ensure the orderly management of a particular economic activity in a sustainable manner. A fundamental feature of geoscience

information projects should be that they are not implemented for the good of the geological survey but rather to serve the clients who are the end-users of the information. The viability of an information project depends on the clarity with which its goals are set and how the requirements of the end-users are integrated into the project design.

108. The collection, management and distribution of geoscience information require a long-term commitment from the host organization because the data have a long useful life. The development and maintenance of the skilled staff required to support these databases are critical to the success of a database project. The training of skilled staff takes several years; in contrast, hardware and software can be delivered within a few weeks or months.

2. Types of geoscience information projects

109. There are three types of projects, each of which has particular requirements to ensure successful implementation.

(a) Building a database from existing hard-copy information

110. For example, an organization with documents produced over 40 years of extensive geological investigations, which are housed within a well-run library or archive, is in an ideal position to undertake a database project in which the conversion of the data to computerized format is the major activity. In larger projects of this type, 80 to 90 per cent of project cost is for the data conversion and the remaining funds are for database design and system purchase and implementation. In some developing countries this ideal situation does not exist. The geological field-work may have been carried out, but the documents recording these activities are either in a disorganized state or even completely missing. It is essential that the source documents for an information project are all accounted for and well organized. If documents are not present within a country, they may be available in the geological organizations of an ex-colonial Power. Quality and coverage of data, as well as the local infrastructure to support the project, must be assessed prior to the commencement of the project.

(b) Building a database by reinterpreting or reprocessing existing data

111. A basic requirement is that the source data must be of sufficient quality and geographic coverage to justify the cost of reinterpretation or reprocessing of the data and creating the database. Examples of this type of project are (1) creating a database of the geology of a country incorporating modern geological concepts, in order to publish a new national geological map; and (2) processing aeromagnetic data displayed as profiles on paper maps so that the end product is a database of gridded data that can be displayed as shaded relief models.

(c) Building a new database by collecting new data in the field and adding them to the database

112. As this project does not depend on existing data, the project has full control of the quality of the final database. An example of this type of

project would be building a database on small mines by visiting all the mines, filling in data sheets on each mine and subsequently entering the data in the computerized database.

3. Elements of a successful geoscience information project

(a) Design

113. A project must be designed to take into full account the local conditions under which it will be implemented. The following should be considered in the design of the project:

(a) Overall purpose of the project;

(b) State of existing data, if part of project;

(c) Skills of staff assigned to project;

(d) Local infrastructure;

(e) Existing equipment.

114. The design should be modular and incremental, with each module having well-defined deliverables. Only after one module is successfully completed should the next module start. The technical difficulty of a project should match the capability of the staff of the agency that will carry out the project.

(b) Training

115. The training for one module should prepare staff for the next module. It is critical, especially at the start of the project, that in each module the training take into account the skill level of the staff. Training courses should be given throughout the life of the project and relate to the current or upcoming activities of the project. The courses should cover all skills required and should not be confined to computer skills. Upper management of the agency should be provided with a familiarization course on information management. Courses for geological and computer staff should be provided in project design, project management and documentation, as well as on specific computer topics. If the project is a large one with many data-conversion staff, the concept of training the trainers should be used. For example, documented procedures developed during training by local professional staff should be used by data conversion operators during building of databases; these procedures should form the basis of a course given to the operators by the professionals who developed them.

(c) Staffing

116. Local staffing for the project should be large enough to manage it and should be fully involved in database design and the implementation of the project. Only through complete local ownership of the project will the project be technically self-sustaining. Large data-conversion projects (for example,

building a large map database from hundreds or thousands of maps) are very labour intensive and thus expose many people to working with high technology. Ideally there should be continuity of staff on the project (low staff turnover and minimum staff reassignment) so that the project benefits from the training it provides.

(d) Technology

117. New technologies for the storage, retrieval, analysis and display of data, especially spatial or map data, which are central to the activities of geological surveys, offer extraordinary opportunities to improve the effectiveness of geological surveys in performing their activities and communicating the results of these activities to their clients. The introduction of these new technologies is at an early age in surveys in the developed world. Surveys that introduced mainframes and minicomputers over the last 20 years have such an investment in their equipment that it is difficult for them to move quickly to the more recently introduced and highly cost-effective technologies such as workstations. This provides an opportunity for surveys in the developing world to move directly to the new technologies which are well suited to the demands made by projects designed to handle integrated geoscience databases, the modern approach to geoscience information. The introduction of the new technologies offers a paradigm shift which can enable those who recognize it to move to a leading position.

118. The selection of hardware and software technology is based on the complexity of the project to be carried out. This selection is made in the latter part of the project design and takes into consideration the technology currently used in the organization as well as that used in agencies with which the geological organization must interact. Standardization of software, such as word-processing software is often useful but can be harmful if applied to complex application areas, such as geographic information systems, that require the use of map data by many disciplines with a wide range of different types of data and analysis requirements.

(e) Technical support

119. Technical support is critical to the successful implementation of information projects and begins well before the start of a project. The Mineral Resources Branch of the Department of Economic and Social Development has conducted interregional and regional seminars to introduce geoscience information concepts and projects. Once a project is proposed and subsequently approved, a range of services, such as project design, training and study tours, management services and consulting services for specific technical topics, are required to support the project.

4. Opportunities resulting from availability of geoscience information

(a) Government policy

120. National geological surveys are providers of information that is used by Governments to define policies on natural resources, natural hazards and the

environment and provides the basis for the implementation of these policies. The introduction of information systems in developing nations will enable existing and new data to be used more effectively to assist Governments in their policy goals.

(b) Foreign investment

121. If a developing country wishes, over the next decade, to be competitive in attracting foreign investment for mineral resources development, it will be essential to provide computerized geoscience information services to support mineral exploration. The issue is one of efficiency: exploration is an information-based activity, requiring comprehensive and well-organized data. The ability to use computers to search and display these data, including geoscience map data, radically improves the cost effectiveness of the search for mineral resources. This reduces the cost of exploration and increases the potential for a successful outcome.

122. Computerized data are compact and easily transportable. They can be analysed at the home base of the potential investor and thus form an essential part of a package to attract investment. The ability to develop such an information package also reveals to investors the capability of the country in which they are being invited to invest.

V. RECOMMENDATIONS OF UNITED NATIONS MEETINGS AND SEMINARS RELATED TO INVESTMENT IN THE MINERAL RESOURCES SECTOR

A. Interregional Seminar on Mining Taxation

(Montreal, 30 September-4 October 1991)

123. The Science and Technology, Energy, Environment and Natural Resources Division of the Department of Economic and Social Development, organized the Seminar in collaboration with CIDA and the Canadian Institute of Mining, Metallurgy and Petroleum, under its mandate for policy guidance in the field of mineral resource development.

124. Because of their capital-intensive and high-risk nature, mining activities in developing countries are critically dependent on attracting foreign investments under conditions that, while ensuring government revenues, also provide a fair return to private investors commensurate with the risks they have taken. Experience suggests that a sound mineral taxation regime is one of the keys to promoting such investments; conversely, inappropriate tax rules may make projects that are otherwise commercially viable unattractive to investors. They may also reduce the fiscal revenues from mining operations.

125. However, a tax regime acceptable to all parties is difficult to formulate. At issue is the question of how both industry and Government can reap financial benefits in a win-win situation, providing acceptable profits to the mining company while ensuring that non-renewable resources are used wisely, that compensation is fair and that the rights of future generations are protected. The United Nations is cognizant that every country has its own identity and development goals, and every mining company its own strategy. The Seminar was

therefore designed to provide a variety of views and options to assist each country in selecting for itself the measures best suited to its purpose.

126. The Seminar, while addressing many issues in mineral development, suggested the following objectives for Governments in designing fiscal regimes: a fair financial return for their resource; benefits for the economy as a whole, especially the development of local industries; opportunities for education and training of the country's nationals and achievement of transfer of technology; and assurance that the Government bears as little risk as possible. Proper environmental protection is now an equally important consideration. Critical objectives for industry include: a taxation system that permits an acceptable rate of return on investment; certainty of long-term rights to the minerals that are to be developed; contractual, legislative, and political stability; and assurance that management and operations can be conducted on a commercial basis.

127. A series of industry and government presentations provided details and examples of these principles. The World Bank paper described an enabling environment for mining exploration and investment, including a fiscal regime with the following features: fixed, non-negotiable, mineral-sector tax terms; profit-related taxes rather than duties and royalties; taxes universally applicable to foreign, domestic, and State enterprises; incentives such as accelerated depreciation rather than tax holidays; taxes competitive with those of other mineral-producing countries; and avoidance of double taxation through tax treaties. It was pointed out that a variety of tax mechanisms were available and they should be selected on the basis of their contribution to Government objectives, for example, short-term revenue or accelerated development, steady revenue or higher participation in bumper profits. Several papers emphasized the importance of a well-administered fiscal regime. A computer model was used to demonstrate the powerful effects of tax rates and structures on profitability.

128. Other papers considered the fiscal implications of government equity participation in mining projects and presented descriptions and instructive analyses of the different fiscal policies and experiences of Canada and Chile in securing revenues and promoting investments. The fiscal significance of small-scale mining activity in Africa was found to be less important than its contribution to mineral discoveries.

B. Interregional Seminar on Applied Finance for Natural Resources

(Bangkok, 9-14 December 1991)

129. The Science and Technology, Energy, Environment and Natural Resources Division of the Department of Economic and Social Development convened the Seminar in conjunction with the Economic and Social Commission for Asia and the Pacific (ESCAP) to ensure that executives and managers in developing countries are in a better position to allocate scarce resources to define and evaluate natural-resource projects, by familiarizing them with the skills and tools used by the world banking community for such purposes. For want of such knowledge, some 75 per cent of all projects fail. The Seminar framework was developed as

a series of case studies, supplemented by lectures and discussions. Senior officials of financial institutions acted as resource persons.

130. Mining finance can be defined as the management of a mining company's money, including the raising of funds. Project financing usually involves three major players: sponsor, investor and financier, each of whose perspectives are different. The objective is to minimize risks to lenders and maximize the return to investors. Sources of finance include equity; debt, such as commercial debt, mezzanine financing and agency (World Bank etc.) financing; debt/equity swaps; credits; leasing, and pre-production sale of products, such as gold loans. Debt finance is generally not available for exploration or small mines. Details of each class of finance were provided at the Seminar.

131. The structuring of finance in terms of debt and equity and the assessment of and protection against risks demand careful management and organization. Risks include (i) those outside company control (reserve, market, infrastructure, environmental, political, force majeure); (ii) those within company control (operating, participation, engineering and completion); and (iii) those within the bank's control (syndication, funding and legal). A firm understanding of risk sharing is essential. Leasing/tax benefit financing was introduced at the Seminar as a means of utilizing tax law to enhance economics for the project and/or for investors or lenders. It is particularly interesting as a means of avoiding large cash outlays and saving money in other ways, and is especially beneficial when exporting to countries with soft currencies.

132. The Seminar concluded by recommending that more training seminars and workshops on finance and related matters should be held in developing countries; that developing country resource persons should also be trained; and that a market development seminar should be held.

VI. CONCLUSIONS

133. Modern mining and processing methods are very capital-intensive and their attendant infrastructure is so large that developing countries will have to rely increasingly on foreign investments for the development of their mineral resources. In attracting foreign capital for the development of their mineral sector, the Governments of developing countries should therefore pay particular attention to their policies and procedures as they apply to foreign enterprises and attempt to make them competitive.

134. There are a number of bilateral, multilateral and private sources which can assist developing countries in establishing ways and means of attracting foreign capital and in financing the development of their mineral resources.

135. The feasibility of successfully establishing geological information projects in developing countries depends primarily on project design and the care with which it is carried out. A project that is not sensitive to local conditions will fail to a greater or lesser extent. A majority of developing countries require assistance in both technical and management aspects of implementing a successful geoscience information project.

Notes

1/ See International Monetary Fund, Primary Commodities, Market Developments and Outlook (Washington, D.C., July 1990), chap. V.

2/ World Economic Survey 1990 (United Nations publication, Sales No. E.90.II.C.1), chap. III.

3/ "A global survey of mining company investment preferences: mining investment conditions in selected countries of the Asia-Pacific region" (ST/ESCAP/1197).

4/ A similar seminar was held in Canada for the United Republic of Tanzania at Prospectors and Developers Association meetings. The project was funded mainly by CIDA with arrangements made by Romanex International Ltd., a Canadian junior exploration firm active in the United Republic of Tanzania.

5/ Mining Annual Review (London), 1992.

6/ Ibid., p. 95.

7/ Mining magazine (London), October 1992.

8/ Mining Journal, vol. 319, No. 8201 (27 November 1992).

9/ Mining magazine, September 1992, p. 192.

10/ Ibid., April 1992, p. 25.

11/ Mining Annual Review (London), 1992, p. 132.

12/ Ibid., p. 53.

13/ Metals and Minerals Annual Review (London), 1992.